At Berth Vessel (Shore Power) Regulation

Shore Power Workgroup Meeting

June 1, 2007

California Environmental Protection Agency

Air Resources Board

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Questions Via E-mail

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Topics

- **Draft regulation language**
- Preliminary cost effectiveness
- Next steps

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Draft Regulatory Language

- Partial regulation
  - Major provisions provided for shore power categories
  - Other ship categories and harbor craft will be included in next draft

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Draft Regulatory Language (Continued)

- Three options to comply
  - Limited auxiliary engine operation
  - Fleet emissions
  - Clean engines

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Draft Regulatory Language (Continued)

- Limited auxiliary engine operation
  - Affects container ships, passenger ships, and refrigerated cargo (reefer) ships
  - 2015 and 2020 requirements based on ship visits and size (container ships only)
  - Ships affected based on prior year ship activity

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Draft Regulatory Language (Continued)

- Fleet emissions
  - Same amount of reductions must be achieved if applicable ships satisfy the requirements for limited auxiliary engine operation
- Cleaner engines
  - Requires engines be 80% cleaner
  - Requirement phased-in

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Draft Regulatory Language (Continued)

- Reporting and recordkeeping
  - Responsible Official certifying compliance
  - Report noncompliance

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Topics

- Draft regulation language
- **Preliminary cost effectiveness**
- Next steps

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Preliminary Cost Effectiveness

- Feasibility report comments
  - Cost-effectiveness criteria
  - Use of generic infrastructure costs
  - Port and utility infrastructure
  - Electricity costs
  - Ship lifecycle
  - Growth

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Preliminary Cost Effectiveness (Continued)

- Cost-effectiveness criteria
  - NOx
    - SJVAPCD Rule 4307 (boilers)
    - Retrofit: $5,000 - 49,000 per ton
    - New: $7,000 - 68,000 per ton
  - Diesel PM
    - ARB rule for public and utility fleets
    - $320,000 per ton

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Preliminary Cost Effectiveness (Continued)

- Shore-side infrastructure costs
  - $1.5 - 5.0 million per berth
  - Not include utility costs
- Ship-side infrastructure costs
  - $500,000 - $2,000,000 per ship
  - Most estimates under $1,000,000 per ship

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Preliminary Cost Effectiveness (Continued)

- Electrical costs
  - Demand is based upon highest power needs, which results in higher electrical costs
  - Containership is 7 MW
  - Passenger ship is 15 MW
  - Reefer ship is 4.5 MW

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Preliminary Cost Effectiveness (Continued)

- Ship lifecycle
  - Ships are moveable assets
  - Evaluating data for four year period (2003-2006)
  - For cost-effectiveness analysis, additional ships retrofitted

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Preliminary Cost Effectiveness (Continued)

- Growth to 2020
  - Container based upon Mercator Report, 2005
    - Ships 50% larger and overall visits increase by 170% compared to 2004
  - Passenger based upon Dr. Corbett work (University of Delaware)
    - Passenger increase 500% compared to 2004

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Preliminary Cost Effectiveness (Continued)

- Other issues
  - Split costs between NOx and diesel PM
  - Revise capital recovery time period
  - Phasing-in cost over time
  - Incremental cost effectiveness
- Examples
  - Container ship
  - Passenger ship
  - Reefer ship

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Container Ship

- Cost effectiveness, 2006
  - NOx: $43,000 per ton
  - PM: $1,500,000 per ton
- Cost effectiveness with larger ships, 2006
  - NOx: $32,000 per ton
  - PM: $1,200,000 per ton
- Cost effectiveness with larger ships and more visits, 2020
  - NOx: $29,000 per ton
  - PM: $1,100,000 per ton

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Container Ship
(Continued)

- Cost effectiveness with larger ships, more visits, and retrofit 30 percent more ships, 2020
  - NOx: $37,000 per ton
  - PM: $1,300,000 per ton

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Passenger Ship

- Cost effectiveness, 2006
  - NOx: $39,000 per ton
  - PM: $1,500,000 per ton
- Cost effectiveness with larger ships, 2006
  - NOx: $ 36,000 per ton
  - PM: $ 1,400,000 per ton
- Cost effectiveness with larger ships and more visits, 2020
  - NOx: $8,500 per ton
  - PM: $320,000 per ton

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Reefer Ship

- Cost effectiveness, 2006
  - NOx: $35,000 per ton
  - PM: $1,300,000 per ton
- Cost effectiveness with larger ships, 2006
  - NOx: $28,000 per ton
  - PM: $1,000,000 per ton
- Cost effectiveness with larger ships and more visits, 2020
  - NOx: $26,000 - 30,000 per ton
  - PM: $97,000 - 1,100,000 per ton

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Topics

- Draft regulation language
- Preliminary cost effectiveness
- **Next steps**

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Workgroup Schedule

- Next meeting is July 12 in Sacramento, 1 pm

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